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山西保德印度熊一新种[1)]

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摘要　记述了印度熊一新种, *Indarctos zdanskyi*。正型标本是保存在一起的相当完好的头骨、下颌和寰椎,采自山西保德赵家沟的三趾马红土层中。新种以个体大,头骨矢状嵴高耸,乳突特别粗大并向外伸展,外耳道很细长,内鼻孔特别窄长,下颌联合后缘接近 p4,颊齿相对较小,前臼齿高度退化,P4 长于 M1,m1 前窄后宽,而 m2 前宽后窄而区别于本属已知各种。

关键词　山西保德,晚中新世,印度熊

中图法分类号　Q915.874

几年前本文作者在研究山西榆社的食肉类化石材料时,戴福德(R. H. Tedford)注意到在美国自然历史博物馆的 Frick 藏品中有一个产自中国的印度熊(*Indarctos*)的头骨。该标本是 Childs Frick 所雇的中国技工刘师固(译音)于 1934 年寄给他的,箱号为 46 - L391。这件标本一直没有研究发表。2001 年夏邱占祥在访美期间和戴福德一起对这件标本作了仔细的观察,发现它和过去在保德发现并已研究发表的 *Indarctos lagrelii* 及 *I. sinensis* 都不同,应为一新种。榆社也有这种印度熊的材料,但保存得很零散。印度熊的头骨化石很少,在欧洲曾有少量发现(西班牙 Can Llobateres 和希腊 Samos),但在中国至今没有发现过。考虑到这件标本对于我们进一步了解中国印度熊的性质具有重要意义,现予研究发表。

师氏印度熊(新种)　Indarctos zdanskyi sp. nov.

1924　? *Hyaenarctos* sp., Zdansky, 26～27, pl. Ⅲ4～5

正型标本　F:AM 22345,基本完整的头骨、下颌和寰椎,老年个体,产自山西保德赵家沟,晚中新世;现存美国纽约自然历史博物馆。

归入标本　破碎头骨,河南新安县陈沟湾(Zdansky, 1924. p. 26～27, pl. Ⅲ4～5),现存瑞典乌普萨拉大学古生物博物馆,IVPP 存有腭部的模型。

特征　大型印度熊,头基长 > 400mm,下颌全长 > 300mm。枕部高,矢状嵴十分发育,向后增高为垂直板状;乳突特别粗壮,向外伸展很远,远超过上耳道棚架;外耳道长管状,长度超过耳泡的宽度;内鼻孔特别窄长。下颌高而粗壮,联合部后缘位于 p4 稍前。颊齿相对较小;P4～M2 之长小于头基长的 1/4;裂齿前的前臼齿在大小和数目上都高度退化;P4 长于 M1,具较大前附尖;M2 内后齿带架("跟座")较小;m1 跟座明显宽于三角座;m2 的三角座明显宽于跟座。

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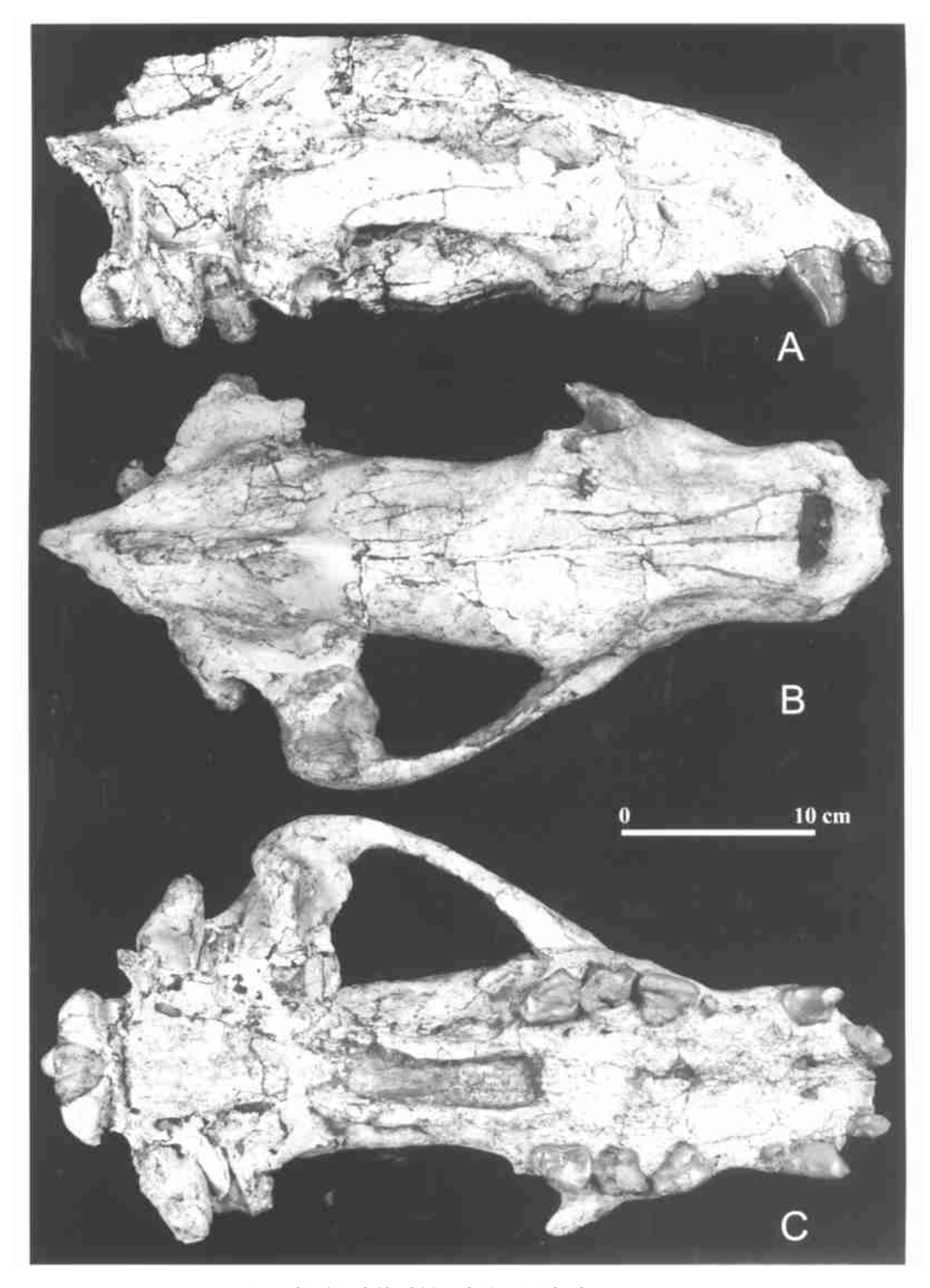


图 1　**师氏印度熊(新种)头骨,正型标本** F:AM 22345

Fig. 1　Skull of *Indarctos zdanskyi* sp. nov., holotype F:AM 22345

A. **右侧面** right lateral view; B. **顶面** frontal view; C. **腹面** ventral view

词源　种名献给首先记述过此类印度熊的师丹斯基(Otto Zdansky)。

描述　枕骨顶部和矢状嵴后端破失,左颧弓中段破损;头骨在额骨和顶骨交界处和基蝶骨部分破碎,经石膏修复;在右颧弓的前、后端,额面和人字嵴等处也稍经修复。

枕面三角形;如果矢状嵴后端保存,三角形的上角则非常尖锐,呈薄板状;自枕顶(不带矢状嵴)至乳突下缘高150mm,至枕大孔上缘距离83mm,矢状嵴高约35mm;枕面的底宽(两乳突外缘间距离)200mm;枕大孔很宽,40mm,宽于单个枕髁的宽度(25mm);乳突在枕面上出露很宽大;右侧副枕突保存较好,但末端亦稍破碎,与乳突相比很小;其根部断面11mm ×11mm,与乳突以一宽凹相隔。

侧面(图1 A)　头骨顶缘比较平直,在矢状嵴前端处微微凸出,形成顶缘的最高点;矢状嵴向后迅速变高,变为板状;颞骨颧突很长,其前端达到眶后突处,颞颧骨缝近于水平,长117mm;颧弓在中部的高为41.5mm;颧弓前端的后缘位于M2前半部之外;眼眶很小,长42mm;颧弓上的眶后突明显,但较圆钝;上颌骨在眼眶之前的部分凹陷,眶下孔位于P4后半部的上方;鼻骨前端位于C后缘的上方。

顶面(图1 B)　头骨较细长;最宽处位于关节突处;颧弓外缘较直,和关节突后缘以角状相交;乳突向外突出很明显;矢状嵴始于关节突前缘之前,额嵴表现很弱;额面在眶后突水平有中矢凹;鼻骨后端骨缝保留不好,大约止于眼眶前缘水平,鼻骨前宽后窄,其侧缘稍呈弧形,而不为直线形,鼻骨中矢长115mm,两鼻骨前端宽52mm。

腹面(图1 C;图2)　基枕骨宽大于长,最宽处位于副枕突后方,宽约80mm,两后破裂孔(图2 plf)内缘之间的距离为55mm,基枕骨腹面长(自前骨缝至枕大孔前缘)仅60mm;髁孔(图2 cf)非常小,位于副枕突(图2 pp)后缘水平,远离后破裂孔,两者相距14mm;后破裂孔窄(7～8mm)长(15mm);茎乳孔(图2 sf)位于后破裂孔的外方,在腹面开口;乳突(图2 mp)伸向侧下方,其内下面和后面较平,前面和外侧面则组成弧形面,自后缘测量,其宽为33mm。听泡(图2 b)相对较小,腹面平,其前缘有两个凹陷,内者小而深,外者宽浅,外耳道(图2 em)非常细长,12mm ×25mm,其长大于听泡的宽(～20mm),听泡长46mm;颞骨的鳞部组成很宽大的上耳道棚板(图2 ss);关节后孔细小,位于关节后突的内后角;没有翼蝶管。内鼻孔很长(120mm)而窄(25mm),其前端位于

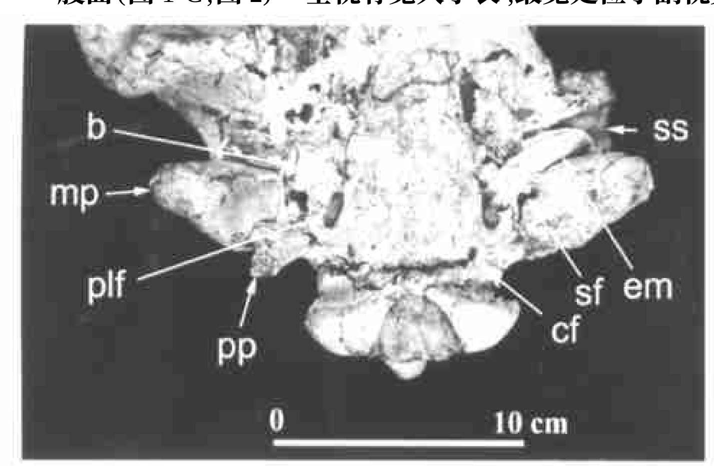


图2　师氏印度熊(新种)头骨基枕部,正型标本F:AM 22345

Fig. 2　Basicranium of *Indarctos zdanskyi* sp. nov., holotype F:AM 22345

b. bulla 听泡; cf. condyloid foramen 髁孔; em. external meatus 外耳道; mp. mastoid process 乳突; plf. posterior lacerate foramen 后破裂孔; pp. paroccipital process 副枕突; sf. stylomastoid foramen 茎乳孔; ss. suprameatal shelf 上耳道棚板

M2 后半部水平;颞孔自腹面看很大,约为 110mm ×110mm。后腭孔位于 M1 中部水平,其后还有另一个腭孔(右侧大,左侧小),位于 M2 前半部水平;腭上颌骨缝自 M2 内侧向前,穿过后腭孔(但绕过其后的孔),然后向中矢面弯曲,其最前端位于 P4 原尖之后;前腭孔位置较靠后,其后缘在 C 后 1/3 水平,其后缘至 I2 后缘间距离为 42mm;上颌在 I3 处的宽度为 63.5mm。

上牙齿(图 1 C)　门齿中只有右 I2～3 和左 I3 保存,所有牙齿,除 P1 和 P3 外,皆深度磨蚀。I2 的磨蚀面近水平,而 I3 者有水平和面向后外方的磨蚀面,两者平缓过渡,门齿上没有见到齿带和附属小尖(已磨蚀)。I3～C 齿隙 10mm。C 接近于垂直,很粗大,根粗大于齿冠,齿冠上可见水平和面向前内方的磨蚀面(与下犬齿),和微弱的后棱。右侧有两个很小的圆形齿槽(P1 和 P2)和 P3,左侧有 P1,和 P3 的前小和后大的两个齿槽,而没有 P2。P1 和 P3 的齿冠形态接近,很小,皆为低冠,唇侧凸,舌侧平,可见齿带;P1 的长轴多少向前内方趋中,而 P3 几乎接近横向。C～P4 长 40mm。P4 有一大的前附尖和深的裂凹,原尖部分大,估计应为双尖;M1 已磨蚀至根部,估计其齿冠短于 P4 者;M2 接近三角形,后端迅速变窄,舌侧与中矢面平行,而唇侧斜向内后方。

下颌(图 3)　非常粗壮。水平支高,下缘隆凸,向前不显著变低,颏嵴自侧面清晰可见,下缘在 m3 之后明显上升。联合部粗壮,其后缘位于 p4 之前 13mm 处;每侧有三个颏孔,左侧者三个颏孔大小接近,右侧者前、后颏孔稍小;前颏孔位于 c 后缘之下,中颏孔位于 p4 之前下方,而后颏孔位于 p4 之后端的下方;在中颏孔的上方可见一凹陷。垂直支宽大而高,其前缘很宽厚,组成圆弧形,其外侧的咬肌窝很深,咬肌窝的前缘和下缘组成近直角的前下角;没有前咬肌窝;角突很发育,在舌侧组成一水平的隔板(shelf);关节髁很宽。

下牙齿(图 3 B)　门齿没有保存。c 弯曲,后棱很微弱。右侧有一相当大的 p1 的圆形齿槽,一哑铃形的 p2 的齿槽,和一个很小的 p3 的齿槽(带部分齿根);左侧则仅有一个 p3 的齿槽(带有部分齿根)。p4 相对较小,齿冠舌侧缘更为隆凸;m1 的跟座宽于三角座,并以外中沟相分;其前下内尖靠近下后尖,而距离牙齿的后缘较远;m2 的三角座明显宽于跟座;m3 近三角形。

比较与讨论　F:AM 22345 头骨和下颌应该归入 *Indarctos* 而不是 *Agriotherium*,这一点是很清楚的。这主要表现在其颧弓前端起始于 M2 的中部之前(在 *Agriotherium* 中在 M2 后半部),下颌没有前咬肌窝(在 *Agriotherium* 中有),P4 双原尖,M2 呈三角形,有大的"跟座"(在 *Agriotherium* 中 P4 单原尖或在原尖前有一很小的尖,M2 梯形,没有明显的"跟座"),m1 有两个下内尖(在 *Agriotherium* 中下内尖只有一个)等。

印度熊的化石在欧亚大陆和北美普遍发现,但完整的头骨非常少。在欧亚大陆只在希腊的 Samos 地点发现过两个 *Indarctos atticus* 的带下颌的头骨(Helbing, 1932; Thenius, 1949,1959);在西班牙的 Can Llobateres 发现过 *Indarctos vireti* 的残破的带下颌的头骨(Crusafont-Pairo and Kurtén, 1976)。

Indarctos vireti 是印度熊属中目前所知最原始的种。它和 F:AM 22345 标本差别十分明显。除大小差别显著(见表 1～2)外,其下颌水平支的前半部明显较后半部低,使下颌的下缘呈明显的弧形;后边的一个颏孔距离前边的两个颏孔相当远(因前臼齿齿列长);前臼齿都还很大,除第一前臼齿外,都是双根;P4 的原尖刚刚开始有双分的迹象;臼齿的内

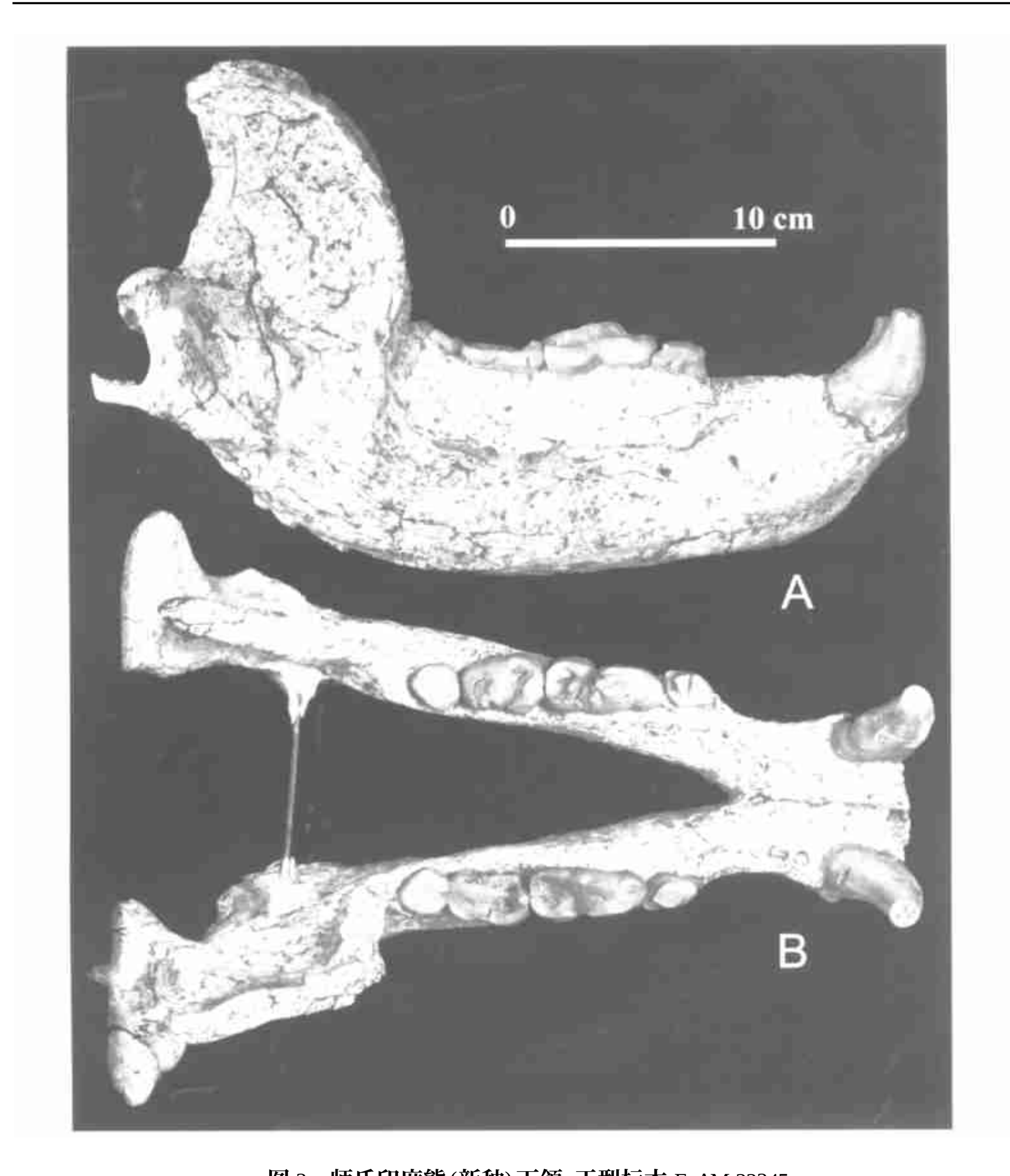


图3 师氏印度熊(新种)下颌,正型标本 F:AM 22345

Fig. 3 Mandibles of *Indarctos zdanskyi* sp. nov., holotype F:AM 22345

A. 右侧面 right lateral view; B. 冠面 crwon view

齿带很发育,M1由于内齿带特别发育而呈五边形等。遗憾的是, *Indarctos vireti* 头骨的基枕部保存不好,无法作进一步的比较。

Indarctos atticus 是Dames于1883年首先记述的。标本是一件带有m1～m2和m3的齿槽的下颌残段,产自希腊的Pikermi。遗憾的是,Dames没有正式定名。Weithofer于1888年又一次记述了这件标本,并使用了Dames在标签上使用的种名: *Hyaenarctos atticus* (现应为 *Indarctos atticus*)。后来在希腊的Samos岛上又发现了更好的材料,包括完整的头骨和下颌。现在一般都认为,Samos这些材料才是 *Indarctos atticus* 的更好的代表。和Thenius

(1949 ,1959) 记述的头骨相比 ,F:AM 22345 不但尺寸明显较大(见表 1～2) ,而且在长宽比例上也有较显著的差别。首先 ,F:AM 22345 头骨的牙齿相对较小。F:AM 22345 的头基长是 415mm ,在 Samos 的头骨中 ,最长的只有 325mm。但它们的牙齿在大小上的差别却很小(见表 1) 。其次 ,F:AM 22345 头骨的中部 ,亦即内鼻孔的部分 ,在比例上特别长。其 M2 后缘至关节窝后缘之间的距离为 110mm ,长于 P4～M2 的长度(95mm) ;在 Samos 的头骨上 ,前一距离仅为 82mm (根据 Thenius , 1959 , Fig. 6 测量) ,而 P4～M2 之长为 86mm ,亦即前者短于后者。此外 ,F:AM 22345 头骨的矢状嵴特别高耸 ,乳突特别大而向外突出 ,其末端远超出上耳道棚板 ,外耳道为长管状 ,其长度超过鼓室的宽度。F:AM 22345 下颌联合部的后缘位置特别向后延伸 ,接近 p4 的前端。在牙齿中 ,P4 长于 M1 和 m2 前宽后窄的程度较高。这些都和 Samos 的材料不同。F:AM 22345 显然不能归入 *Indarctos atticus*。

在我国过去没有发现过 *Indarctos* 的完整的头骨。在保德发现的 *Indarctos lagrelii* (Zdansky , 1924) ,只保留头骨的前半部 ,但齿列保存完好。它的齿列在大小上显然比 F:AM 22345 小(见表 1～2) ,形态上也有差别 ,主要表现在它的前臼齿退化程度较低 ,尺寸较大 ,第二和第三前臼齿仍然为双根 ;P4 和 M1 差不多等长 ;下牙中 p4 仍然很大。

在山西保德和新疆温泉发现的 *Indarctos sinensis* (Zdansky , 1924 ; Li and Chi , 1964) ,只有下颌和下牙。它们的水平支后半部(在臼齿之下) 都很低。不过 ,这可能和它们属于幼年个体有关。从温泉的材料看 ,其联合部的后缘在 p2 附近(Li and Chi , 1964 , Pl. Ⅱ, 1) 。它们的下颊齿在大小上已经接近 F:AM 22345 者(见表 2) ,但 m2 前宽后窄的程度较低。根据我们的对比 , *sinensis* 和 Samos 的下牙(Helbing , 1932) 无论在大小上还是在形态上都非常接近 ,应该归入同一个种。这样 , *Indarctos sinensis* 就成了 *Indarctos atticus* 后出同物异名。

表 1 印度熊头骨的测量与对比

Table 1 Measurements and comparison of skulls of Indarctos (mm)

	Indarctos			
	vireti (VP646)	*atticus*	*lagrelii*	*zdanskyi*
		Crus. & Kurt. ,1976	Zd. , 1924	F: AM 22345
头骨最大长(Greatest L)				465
头基长(Basilar L)	300	310～325		415
腭长(Palatal L)	150	151～162		190
吻部宽(Rostral W)				108
眶后突处宽(W at postorb. proc.)				135
乳突处宽(W at mastoid proc.)				200
枕髁处宽(Condylar W)	65	74		88
C～M2 L				170
P1 (L ×W)		7.1 ×?	10.2 ×7	11.2 ×8.4
P2 (L ×W)	11.8 ×6.2	7.8 ×?; 9.5 ×7	10.6 ×7.2	
P3 (L ×W)	12.4 ×6.7	11.3 ×7.9 ; 12 ×?	12.5 ×7.8	11.8 ×7
P4 (L ×W)	17.4 ×11.7	29.1 ×24.3 ; 29.5 ×22.5	27.3 ×21.4	32.8 ×24.8
M1 (L ×W)	22.4 ×21.6	29 ×28.5 ; 28.3 ×26.2	27.3 ×25	27 ×25 *
M2 (L ×W)	27.3 ×19.7	27.9 ×19 ; 27.3 ×19.7	32.6 ×23.4	33.5 ×26.6

* 深度磨蚀(Heavily worn) 。

在伊朗 Maragheh 地点发现的 *Indarctos maraganus* 的一个下颌(de Mecquenem, 1925)是欧亚大陆目前所知,除 F:AM 22345 外,尺寸最大的一件标本。但它的下颌联合部的后缘仍然在 p2 之前;其下牙仍然比较原始:前臼齿较大,特别是 p4,比例上较大,m2 前后大致一样宽。如果考虑到印度熊可能有较大的雌雄和个体差异(见 Crusafont-Pairo and Kurtén, 1976, p.13),Maragheh 的标本很可能也应该归入 *Indarctos atticus* 中。

印巴次大陆曾经记载过两种印度熊:*Indarctos salmontanus* 和 *Indarctos punjabiensis*。这两个种在尺寸上都小于师氏种。前者是 Pilgrim 于 1913 年创建的,但详细的描述发表于 1914 年。该种材料很少,只有上臼齿,以 M2 的"跟座"特别长大、附属小尖特别清楚而区别于其他各种。*Indarctos punjabiensis* 是 Lydekker(1884) 创建的,正型标本为 P4～M1。它的 P4 的前附尖小,而原尖侧扁,和师氏种也不同。被 Pilgrim(1932) 归入到 *Agriotherium palaeindicum* 的一件下颌(Ind. Mus. No. D 8, Lydekker, 1884, pl. XXXI 1),显然应该归入 *Indarctos* 属,其水平支外侧面没有前咬肌窝,m1 跟座上的下内尖由两个尖组成。这件标本很可能也应该归入 *I. punjabiensis*。这件标本的水平支低,其下缘平直,在前臼齿和臼齿之下几乎等高,联合部后缘位于 p3 前缘水平,m1 和 m2 前后宽度差别不太明显(见表 2)。在这些特征上它和师氏种有别,不能归入同种。

表 2 印度熊下颌测量与比较

Table 2 Measurements and comparison of mandibles of Indarctos (mm)

	Indarctos							
	vireti	*atticus*				*punjabiensis*	*lagrelii*	*zdanskyi*
	Can Llobateres	V 2922	Pikermi	Samos	Maragheh	Ind. Mus. D 8	Baode	Baode
	Crus. & Kurt., 1976	Li & Chi, 1964	Weith., 1888	Crus. & Kurt., 1976		Lyd., 1884	Zdan., 1924	F:AM 22345
全长(Total L)	218～265			243～246				310
垂直支高(Ramus vert. H)	115			98～111				150
p4 之前高(H ant. p4)	43～53			54		52.7		72
m2 之下高(H under m2)	48～60			61		54.6		79
p1 L	10.4				10		10.4	
p1 W							7	
p2 L	9.9～11.6				9		9.2	
p2 W	6.5～6.7				7		6.4	
p3 L	12.2～13.5	10.1*		11.8	13		12.5	
p3 W	7.7～8	7.7*		8.9	9.5		8.3	
p4 L	16.3～16.9	20.5*		21	23	22.8	21.5	20.8
p4 W	8.9～9.5	13.1*		12.8	14		12	14.8
m1 L	30～34.5	41	38*	41.6	44	42.6	37.5	42.5
m1 W (trig.)	11.3～13.8	17.5	14.3*	18*	17	18.8*	17*	19.8
m1 W (tal.)	14.7～17.3	22.5	19.2*	22.2	22	21.3	20.8	23.3
L/W (tal.)	0.49～0.51	0.55		0.53	0.5	0.5	0.55	0.55
m2 L	22～26.1	30	28	32.4	32	31.7	26.7	30.5
m2 W (trig.)	15.6～18	22.5	20.5*	23.3	23	22.8	20.8	24.3
m2 W (tal.)	13.4～16.2	21.5	19*	20.6*	22	19*	19	19.6
L/W (trig.)	0.68～0.71	0.75	0.73	0.72	0.72	0.72	0.78	0.8
m3 L	14.2～17.2	17.8*	14.4*	21.5		17	16.7	20
m3 W	12.4～14.9	16	14*	17.4		17	14.8	18

* 作者根据图版或标本测量(Measured by the present authors according to plates or specimens)。

Zdansky 曾经描述了一件归属于? *Hyaenarctos* sp. 的头骨(Zdansky, 1924, p. 26～27, pl. Ⅲ4～5)。该标本发现于河南新安县的陈沟湾(Andersson 的 Lok. 13),头骨很破碎,右侧 M2 之后和左侧关节突之后的部分完全缺失,牙齿只有轮廓还可辨认。首先,根据现在我们对印度熊类的了解来判断,这件标本应该归属于 *Indarctos* 属。这从这件标本的 M2 为三角形,具有较大的"跟座"(舌后侧齿带架),以及颧弓前端的后缘位于 M2 的中部即可看出。这件标本的尺寸很大,和 F:AM 22345 非常接近。由于保存不全,只能就可比的部分判断。在这件标本上,自 M2 后缘至关节突前缘间距离,根据图(Zdansky, 1924, Pl. Ⅲ5)测量为 115mm,大于其 P4～M2 之长(95mm);在 F:AM 22345 中前一距离为 110mm,而后一距离也为 95mm;同一距离我们在 Samos 的头骨(Thenius, 1959, fig. 6)上测量所得分别为 82mm 和 86mm,亦即自 M2 后缘至关节突前缘间距离短于 P4～M2 之长。其次,陈沟湾的头骨的矢状嵴非常高耸(Zdansky, 1924, Pl. Ⅲ4),这也和 F:AM 22345 者相同。另外,两者的 P4 都比 M1 长,而在印度熊其他各种中都是 P4 稍短于 M1 或两者大体等长。以上对比使我们相信,陈沟湾的标本也应该归入 *Indarctos zdanskyi* 中。实际上,Zdansky 已经认识到这件头骨与他所记述的 *Indarctos lagrelii* 和 *Indarctos sinensis* 都不同,只是由于材料太少而没有订立新种。Zdansky 的材料中还有一个左 P4 (Zdansky, 1924, Pl. Ⅲ6～7),也和上述头骨一起归入到 ? *Hyaenarctos* sp. 中。这件标本是从杭州的一个药铺中收购的。这个 P4 具有很大的前附尖,应该归入 *Agriotherium* 属。它和上述头骨没有什么直接关系。

致谢 本文材料系刘师固(音译)所采。刘师固乃 Childs Frick 所雇用的技工,在 1930～1939 年间替 Childs Frick 在山西保德一带采集哺乳动物化石。这批化石目前存放于美国纽约自然历史博物馆。本文记述标本系美国纽约自然历史博物馆技工 Edward Pedersen 修理,照片系该博物馆摄影师 Lorraine Meeker 拍摄。

A NEW SPECIES OF INDARCTOS FROM BAODE, CHINA

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Summary

While studying the Carnivora material from the Yushe area a few years ago, Tedford noticed a well preserved *Indarctos* skull from Baode, China, in the Frick Collection housed in the AMNH. The skull in association with its mandibles and atlas was sent to Frick by one of his agents, Mr. Liu Hsi Ku, in 1934. Qiu, while visiting to the AMNH in 2001, together with Tedford, studied this specimen and found that it belonged evidently to a new species of the genus *Indarctos*, widely different from the two known species in China. So far more or less complete skulls have been known only from two European localities (Can Llobateres and Samos). No complete skull has ever been described in China. In view of its importance for our understanding of the Chinese *Indarctos*, it is described here.

Indarctos zdanskyi **sp. nov.**

1924 ? *Hyaenarctos* sp., Zdansky, 26～27, pl. III4～5

Holotype F:AM 22345, almost complete skull in association with its mandibles, from *Hipparion* beds at Zhaojiagou of Baode County, Shanxi Province, China, now housed in the AMNH.

Referred specimen A very poorly preserved skull from Chengouwan of Xin'an County, Henan Province, China, described by Zdansky in 1924 as ? *Hyaenarctos* sp.

Diagnosis *Indarctos* of large size: basilar length of skull > 400mm, and total length of mandible > 300mm. Skull with high cranium, sagittal crest high, plate-like; mastoid process very robust, strongly extended laterally, surpassing the suprameatal crest which lies anterior to it; external meatus very long, tubular, its length > the bulla width, choana very narrow and long. Mandible high and robust, posterior border of symphysis located slightly anterior to p4. Cheek teeth relatively small, P4～M1 shorter than 1/4 of the basilar length; ante-carnassial premolars strongly reduced in size and number; P4 longer than M1, with large parastyle and double-cusped protocone; m1～m2 wide, talonid wider than trigonid in m1, and trigonid wider than talonid in m2.

Etymology The species name is dedicated to Otto Zdansky, who already knew some particular features of this form in 1924.

Brief description and comparison The occipital surface is triangular in form, with its upper angle very sharply pointed, the sagittal crest is plate-like, 35mm high. The mastoid process is extended downward and externally, widely exposed on the occipital surface. The paroccipital process is small, separated from the mastoid one by a wide and shallow depression. In lateral view (Fig. 1 A), the profile of the skull is rather straight. The sagittal crest starts at the level of the glenoid process. The zygomatic process of the temporal bone stretches anteriorly to the base of the postorbital process, 117mm long. The posterior border of the anterior end of the zygomatic arch lies at the middle of the M2. The infraorbital foramen lies above the posterior part of the P4. On ventral side (Fig. 1 C; Fig. 2), the basioccipital bone is very wide. The condyloid foramen lies 14mm posterior to the posterior lacerate foramen. The stylomastoid foramen lies lateral to the posterior lacerate foramen. The mastoid and paroccipital processes form a large depression on the ventral side. The external meatus is long, tube in form, its length is longer than the width of the bulla, ventral surface of which is almost flat, elevated only at its medial border. The postglenoid foramen lies at the medial border of the postglenoid process. No alisphenoid canal can be observed. The choana is very long (120mm) and narrow (25mm). The temporal fossa, seen from the ventral side, is very large (110mm ×110mm). The posterior palatal foramen lies at the level of the middle of the M1.

Of the incisors only right I2～I3 and left I3 are preserved. All the incisors and molars are heavily worn. The wear facet on the I2 is horizontal, whereas there are two wear facets on the I3: one is horizontal, the other faces postero-laterally. Perhaps due to wear, no secondary cusplets or cingulum can be observed on the incisors. The I3～C diastema is 10mm long. C is almost vertically positioned, with two wear facets (horizontal and antero-internal) and weak posterior crest. On the right side, there are two small oval alveoli (for P1 and P2) and a P3; on the left side there are P1 and two alveoli for the P3. P1 and P3 are of the same morphology, both small, low crowned, with a convex labial side, and flat lingual one. P1 slightly converges anteriorly. P3 is almost transversely positioned. The P4 has a large parastyle and large protocone, probably double-cusped. The M1 is worn to its root. But evidently, it is shorter than P4. The postero-lingual cingular shelf ("talon") of M2 is not particularly large. The outline of the M2 crown is roughly triangular.

The mandible is very robust (Fig. 3). Its lower border is markedly convex, with marked "chin" anteriorly and a hook-like angular process posteriorly. The posterior border of the symphysis extends almost to the p4. There are three mental foramina on each side, the posterior-most one located under the posterior root of the p4.

All the lower incisors are absent. On the right side there is a large oval alveolus for the p1, a dumbbell-shaped alveolus for the p2 and a very small alveolus for the p3. On the left side there is only one alveolus for the p3 (with some remnant of root). The P4 is relatively small, more convex on lingual side. The m1 is a typical *Indarctos* carnassial, wider at its posterior half. The trigonid is wider than talonid in m2.

Comparison and discussion *Indarctos zdanskyi* is distinguished from all the other known species of the genus by being larger in general size (Tables 1～2). As far as the skull is concerned, its comparative study is very limited, since skulls are only known in 2 European species (*I. vireti* and *I. atticus*) among the *Indarctos* species. *Indarctos zdanskyi* can be clearly distinguished from these 2 species by the skull characters stated above in the diagnosis.

As far as the teeth are concerned, the distinction between *I. zdanskyi* and the other known species is also clear. In *I. lagrelii* the premolars are much less reduced than in *I. zdanskyi*: the p4 is very large and both upper and lower 2nd and 3rd premolars are still large in size and two-rooted; the P4 is shorter than M1. *Indarctos sinensis* is represented only by mandibles and lower teeth. The horizontal ramus of *I. sinensis* is low, almost as low as the anterior part of the ramus under the premolars (probably due to age), and its m1～m2 are less widened. In general the morphology of the lower teeth of *I. sinensis* is almost the same as those of the European *I. atticus*. They may well be conspecific.

The mandible discovered at Maragheh in Iran and described as *I. maraganus* is also very large, and close to that of *I. zdanskyi* in size. However, the posterior border of the symphysis is situated anterior to the p3, all the premolars are less reduced, p4 remains very large, and the molars are not particularly widened (Table 2). If sexual and individual variation in size is fairly large as Crusafont-Pairo and Kurtén (1976) thought, the Maragheh mandible may well be a large male of *I. atticus*.

There are 2 species of *Indarctos* described from Indo-Pakistan: *I. salmontanus* and *I. punjabiensis*. The former is characterized by having enlarged "talon" and better developed secondary cusplets on its M2, and the latter by having a little developed parastyle and compressed protocone in the P4. Therefore, both are different from *I. zdanskyi* in tooth morpholgy. The mandible bearing the catalogue number Ind. Mus. No. D 8, which was first described by Lydekker (1884) as belonging to *Hyaenarctos punjabiensis*, but later transferred by Pilgrim (1932) to *Agriotherium palaeoindicum*, may well belong to *Indarctos*, in view of its lack of premasseteric fossa and the double-cusped entoconid in its m1. In size this mandible is very close to that of *I. zdanskyi*. However, the horizontal ramus is very low in this mandible, and the molars are narrow (Table 2). It seems inappropriate to refer them to one and the same species.

It is interesting to note that the badly crushed skull from Andersson's Lok. 13 (Chengouwan, Xin'an County, Henan) described by Zdansky (1924, p. 26～27, pl. Ⅲ4～5) as ? *Hyaenarctos* sp. shows great similarity with F:AM 22345. In size they are comparable. The distance between the posterior border of M2 and the posterior border of the glenoid fossa in the Henan skull is 115mm (measured from the plate). This same distance in F:AM 22345 is 110mm, while it is only 82mm in the Samos skull of *I. atticus* (Thenius, 1959, fig. 6). The P4～M2 length is 95mm in both the Henan skull and F:AM 22345, while it is 86mm in the Samos skull, longer than the distance between M2 and glenoid fossa. In the Henan skull and F:AM 22345 the distance between the M2 and the glenoid process is far longer than the P4～M2 length. In the Henan skull the sagittal crest is also very high and plate-like, the P4 is longer than M1 and the "talon" of M1 is small. All this shows that the Henan skull is to be included in the new species, *Indarctos zdanskyi*.

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the classic Baode sites developed by Zdansky in the early 1920's. Liu's collection resides in the American Museum of Natural History, New York, and represents the 2nd most important collection (the 1st being that in Uppsala) from Baode outside of the People's Republic of China.

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